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## Smart grids and the governing of energy use: reconfiguring practices?

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### Abstract

The emerging logics of smart grids rely on reconfiguring the ways in which energy is used in everyday life. In this chapter, we examine the ways in which the governing of energy use through the smart grid is creating new forms of ‘self-government’ tied to emerging alignments between the rationalities of decarbonisation and household economies, and how such interventions seek reconfigure practices in order to realise the intention of smart grid interventions.

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## Introduction

Located at the intersection of policy debates on the need to decarbonise the economy in response to climate change, energy security and the future sources of generation capacity, and how to finance the renewal of aging infrastructure networks, the future design, organisation and delivery of electricity networks has attracted widespread public debate (Verbong et al. 2012: 2). As Lehtonen and Nye (2009) suggest, the potential of smart grids – forms of electricity network that are “intelligent” and able to respond to shifting patterns of supply and demand across the network in (more or less) real time – to provide “active network management” is seen as a critical means through which to “green” the network. Such technological developments are accompanied by the notion that rather than supply being geared towards meeting demand, the challenges facing the electricity sector require that demand is also brought into line with available supply.

In this chapter, we seek to interrogate this phenomenon through a particular perspective, examining the ways in which the governing of the smart grid are being undertaken and the ways in which everyday social practices are implicated and entwined in these endeavours. We suggest that viewing the system of energy provision as socio-technical requires that we consider the ways in which supply systems and infrastructural arrangements are not only critical to the functioning of social practices, but constitutive of them, while social practices likewise serve to constitute the electricity network. From this starting point, we draw on the concept of governmentality to consider how the governing of energy systems takes place through the rationalities and techniques which seek to configure social and material entities such that social conduct is aligned with particular interpretations of the problems of the electricity grid and how they might be addressed. Considered as working through the conduct of everyday actions, we suggest that governmentality provides one potentially productive route through which to examine the ways in which social practices are governed, and with what consequences. We then introduce the project of which this work is a part, the UK Low Carbon Network Fund Customer Led Network Revolution (CLNR), and consider three particular forms of intervention being undertaken in this project in order to reconfigure provider-consumer relations in the smart grid: low carbon technologies, time of use tariffs, and monitoring and feedback devices. We explore how and why such interventions have (and have not) entailed a reconfiguration of practices in the domestic sphere by considering the extent to which they have fitted in to

existing practices, and the ways in which this is being shaped through new forms of electricity conduct. We suggest that not only are new forms of provider-consumer relationship, as embodied in the logics and practices of the smart grid project, having an impact on social practices but critically that social practices are serving to constitute what it is that the smart grid becomes.

### **Systems of electricity provision and the governing of social practice**

Rather than being a matter of technical innovation and its diffusion, the development of new infrastructure networks can be regarded as a socio-technical project in which diverse elements are assembled and serve to co-constitute new arenas for intervention. As Mitchell (2008: 1117) suggests in relation to the emergence of electricity networks, “the development of domestic electric lighting did not respect such categories. It depended upon networks that tied together humans and electrons, the flow of electric current and the flow of capital, imagination and illumination, the calculation of the cost of copper wiring and of its conductivity.” The co-constitution of energy networks as socio-technical systems also means that “consumers and providers are not only in relationships of organisational co-dependency, but that these relationships can be reinforced and reproduced by the technologies in place” effecting a “co-conscription” in the production of particular modes of electricity provision (Chappells and Shove 2000: 8.44). Energy infrastructures, those which endure and those which are emergent and imagined, are therefore at one and the same time socio-technical, and constituted through the constant relation of provision and use. Viewed as such, regarding energy consumption as driven by behaviours located at one end of a supply system is far from adequate. In this void, social practice theory has emerged as a critical means through which to understand and interrogate the ways in which systems of provision are animated by and through the social world.

Originally concerned with understanding the social world through the practices of which it is comprised, theorists sought to understand how “practices evolve, how they capture and lose us, their carriers, and how systems and complexes of practice form and fragment.” (Shove 2010: 1279). This has proven to be fertile ground for researchers in the environment/energy field, seeking to move beyond behaviour change (to borrow a phrase) and

explore how and why patterns of resource consumption endured and changed. Rather than being a matter of the consumption of resources by individual agents, social practice theory provided a means through which to understand how particular practices were sustained, and in turn served to sustain, systems of provision. The “recurrent reproduction” of social practices (Shove and Walker 2010: 474) is also the means through which “specific socio-technical regimes for the provision of water and energy to householders” are reproduced (Spaargaren 2011: 817). Despite the considerable debates and advances in thinking that have emerged as a result of this productive engagement (none of which are done justice to here), there remains ambiguity concerning what this might mean for how we understand the relation between such systems, with their connotations of some forms of material scripting (or conscription) of practice, and the sense that practice has its own contingent dynamism. Likewise, there has only recently been a turn to consider how the governing of social practices takes place. This debate appears, at first glance, characterised (or perhaps caricatured) as oscillating between calls for the creation of forms of governance that are willing and able to engage social practice – for the deliberate manufacture of forms of ‘co-management’ for example – or to imply that such interventions are pretty much beside the point, considering that practices will, in the end, run their own course. Neither perspective appears to engage very specifically with how “how consumers, users and practitioners are, *in any event*, actively involved in making and reproducing the systems and arrangements in question” (Shove and Walker 2010: 475). For some, the work of consumers, users and practitioners in making and reproducing “the systems in question” is inherently emergent. Yet, elsewhere across the social sciences researchers have been concerned to understand how the governing of the social world is assembled and practiced through techniques and tactics that entrain the work of such forms of agency in relation to particular governmental problematics. In this sense, governing, as the conduct of conduct, may serve to reproduce existing forms of social practice, or to intervene (more or less successfully) in the relation between systems of provision and social practice in order to new objectives.

In seeking to explore how and to what effect social practices are governed, we turn the concept of governmentality, originally outlined by Foucault (2009) and since developed by a number of scholars in different directions (Walters, 2012). Broadly speaking, from this perspective governing can be conceived as taking place through the identification of problems requiring intervention and programmes that seek to “direct conduct or intervene in social processes to produce desired outcomes and avert undesired ones” (Li 2007a: 264). From this

governmentality perspective, notions of smart grid can be seen as different variations around a logic or set of principles that arises in response to the multiple problematics of the current energy system. The translation of these logics into governmental programmes involves a set of rationalities and technologies of government(techniques, calculations, artefacts, etc.) through which both the object to be governed (in this case, the electricity grid) and the subjects through which this should be achieved (variously policy regulators, corporate actors, households and so on) come to be articulated with one another in order to accomplish particular outcomes. A smart grid logic departs from other governmental programmes aimed at the provision of energy in terms of its constitution of the object to be governed, regarding the grid problem as one that involves not only new supply-side concerns surrounding the distribution and qualities of new forms of electricity production but also problematizes demand as something that requires management rather than upkeep. At the same time, it engenders new forms of avowedly active subjectivity both for system providers (generators, distributors, regulators, suppliers) and users (who may use the grid both to supply electricity and to draw it down, and who, either through automation or control, are constituted as engaging in the ‘micro’ management of the grid). Drawing on the discussion above, it is evident that this work is not confined to the physical infrastructure, nor to the generation and supply of energy, but is enacted through the social body through enabling particular ways of thinking about what electricity is for, ways of using electricity, and the techniques, artefacts and devices through which such a mode of electricity provision is maintained (and contested). Central to governmental programmes are technologies or techniques that ‘both make rationalities “visible” and permit their extension through time and space’ (Murdoch 2000: 505) actively constituting the “domains which are to be governed’ (Murdoch 2000: 513). Both the object to be governed, in this case the grid, and the subjects through which this is to be accomplished are therefore not pre-given, but constituted through the workings of particular governmental programmes.

From this perspective, social practices are not only emergent but are actively constituted through the workings of (various) governmental programmes, stemming from the efforts of various agencies to intervene in relation to distinct problematics whether these be those of social welfare, the working of the economy, or the protection of the environment. Further, the extent to which such programmes are realised depends on the ways in which the workings of everyday practice are conducted in different ways. Understanding how and why social practices might change is subject to significant debate, not least because of the implications for various environmental and

resource concerns. Here, the ways in which governmental technologies (tools, techniques, calculations) are conducted is critical. As Li (2007b: 5) sets out “at the level of the population it is not possible to coerce every individual and regulate their actions in minute detail. Rather, government operates by educating desires and configuring habits, aspirations and beliefs.” The workings of governmental techniques are therefore central to establishing “the disposition of things” such that conduct is aligned with particular governmental programmes \* (Foucault 2009: 99). Within the field of social practice, significant attention has been paid to the ways in which things work to constitute particular practices. Things, as constitutive of social practice “do not figure in isolation but ... they “hang together” in specific ways’ (Spaargaren 2011: 817). Where new things are introduced, here through forms of governmental technology involved in the workings of programmes of intervention, what matters is “the levels of fit or misfit the new products show with respect to the existing portfolios of objectives, bodies and meanings involved in the practice” (Spaargaren 2011: 817). Social practice theories therefore suggest that interventions may be more or less successful depending on the extent to which the things introduced through governmental technologies – we might think of leaflets, meters, solar panels, energy bills and so on – can be appropriated, normalised or domesticated within existing practice. Writing on governmentality suggests that these processes of normalisation are not solely self-referencing, and instead increasingly structured through forms of self-government as individuals (and communities) are encouraged to take responsibility (and live with the consequences) of their own conduct (Paterson and Strippel, 2010). While from a social practice perspective, what may matter is the ways in which new things come to be fitted in and accommodated within practice, a governmentality approach also signals how practices may be reconfigured through such processes to align with particular programmes of intervention. From this view, it may be less a question of things fitting in than of their action in realigning the elements that configure practice in order to create a new configuration or disposition of things in which new forms of conduct are undertaken. While social practices may continue, and continue to be known as cooking or washing, through domesticating new things, such forms of practice also become enrolled in, and subject to, governmental programmes and may all become qualitatively different entities. In the case of the smart grid, forms of washing practice that, for example, came to encompass new things by way of time of use tariffs, solar panels or smart meters such that they operate in different ways or at different times of the day would still comprise washing, but in terms of the ways in which they acted with and through the wider socio-technical



relation of the electricity grid could contribute to the co-constitution of an altogether kind of network (e.g. one without an evening peak) in which, as practices, they would themselves be altered.

This is not to suggest that the governing of social practice is either all-encompassing or a matter of the application of force applied as government acts at a distance on the social world. The emergence of new forms of conduct and subjectivity are critically dependent not on the pervasiveness of power and control, but rather on the condition of freedom such that “individual or collective subjects ... are faced with a field of possibilities in which several kinds of conduct, several ways of reacting and modes of behavior are available” (Foucault 2000: 342) and where subjects “are both potentially governable through agency of their responses to direction, as well as being capable of thinking and acting in a manner contrary to that being sought by the governors” (Lockwood and Davidson 2010: 390). Recognising the agency and contingency of social practice and its emergent qualities is therefore an important means through which to counter “the dominant tendency to focus on governmental rationalities” within governmentality studies and instead to focus on the lived and material realities and forms of contestation involved in the actualities of governmental practice (McKee 2011: 3). Governmental programmes are not destined to succeed, and may be resisted, recast, or undone as they work through the social world (Li 2007a). In the remainder of this chapter, we first introduce the smart grid project of which this research forms a part and the methodologies used, before considering the ways in which the drawing into dialogue of social practice theory and governmentality perspectives enable the analysis of the governing of the smart grid and the ways in which this is, and is not, leading to the reconfiguration of social practice through new forms of electricity conduct.

### **Implementing smart grids in the UK: the Customer Led Network Revolution project**

The Customer Led Network Revolution (CLNR) project is led by Northern Powergrid, the Distribution Network Operator for the Humber, Yorkshire and North-East of England (formerly CE Electric UK), together with British Gas, one of the largest energy retailers in the UK, EA Technology, Newcastle and Durham Universities. The project is one of several smart grid trials funded by the UK's energy regulator, Ofgem, through the *Low Carbon Network Fund* which was established to promote innovation amongst the network operators in response to

the challenges of decarbonisation, infrastructure renewal and the integration of renewable generation. The project started in Spring 2011 and will be completed at the end of 2014. The project is guided by five learning outcomes:

1. What are current, emerging and possible future customer (load and generation) characteristics?
2. To what extent are customers flexible in their load and generation, and what is the cost of this flexibility?
3. To what extent is the network flexible and what is the cost of this flexibility?
4. What is the optimum solution to resolve network constraints driven by the transition to a low carbon economy?
5. What are the most effective means to deliver optimal solutions between customer, supplier and distributor?

As is clear from these learning outcomes, the key focus of the project is on understanding how, why and with what costs the electricity system can be made to be more flexible. There are a number of methodologies being conducted across the project in order to address these questions, including various demonstrations on the network (e.g. of new forms of storage, control algorithms), modelling, the use of a smart grid laboratory to simulate particular network conditions and test field results and so on. In relation to the first two objectives, with which the social science element of the research project is most concerned, twenty test cells have been established, each with different combinations of households, SMEs, low carbon technologies, tariffs, smart meters, in-home display and monitoring equipment, through which to trial the effects of different forms of smart grid intervention. Test Cell 1 provides a control and includes approximately 10,000 domestic and 1500 SME customers, each of which has a smart meter. The other test cells range in (designed) size from 100 to 600 customers.

Social science research within the project has been focused on two key issues: trial design (who should be included in each test cell and why); and the research and analysis of household and SME energy use and participation in the trial, designed to contribute to the first two learning objectives above. The methodology adopted for the research and analysis phase has involved two main approaches. First, the design of two survey instruments, one for households and one for SMEs, distributed to all trial participants and to those in Test Cell 1 with email contact details (approximately 4000) once in 2012 and again in 2013, with a total of 1200 responses. Second, a home or

business based research visit, which has involved an interview, home/premises tour, photography and participants drawing of their load curves with over 130 participants and over 230 total interviews. The data collected from the qualitative research is collated and organised through Nvivo, and thematically coded through queries developed iteratively through the research process, listening to recordings and discussion across the project team. This chapter draws on this interview data.

### **Constituting smart energy provision: reconfiguring practices and electricity conduct**

As outlined above, one of the distinctive features of smart grid logics is the way in which the use of electricity, usually referenced by the short-hand demand, has come to be regarded as problematic. In relation to co-existing logics which seek to increase or sustain electricity use, this new found concern with the ways in which electricity is being used represents a rather fundamental shift. Importantly, however, the problematisation of electricity use is confined to particular times (e.g. peaks) and places (e.g. of network overload or where investment decisions are bearing down). This in turn means that different forms of social practice have come to be problematized in the workings of particular smart grids, with consequent social and geographical implications for the so-called roll out of smart grids. This differential problematisation of electricity use has significant implications for how, where and by whom smart grids are being realised. As this differentiated process of governing the smart grid unfolds, interventions seek to fit in with and reconfigure forms of electricity use. Here, we seek to analyse the ways in which social practices have come to be subject to these forms of intervention, and what this might also tell us about the ways in which new forms of electricity conduct are being produced through the smart grid.

Though coming at these questions from a different angle, Strengers (2011: 49-51, emphasis in the original) provides a useful analysis of some techniques through which the rationality of co-management is realised by changing “*what it makes sense for someone to do* by reconfiguring the composition of practices”, including: material reconfigurations of domestic and office spaces that serve to embody “new practice rules”; “technological intermediaries ... material infrastructure and the regulations and standards ... that facilitate them” that could encompass “the provision of small-scale supply systems or alternative service relationships”; as well as new forms

of dynamic pricing and feedback designed to recalibrate how/when electricity is consumed that also serves as a form of rule through which households are expected (in the terms we use in this chapter) to govern their own conduct. The CLNR project embodies several instances of such “new practice rules” and “technological intermediaries”, though is less obviously engaged in the material reconfiguration of home or office space. Examining some such techniques provides insights as to how such techniques are dependent both on how things come to be fitted in to practices and in turn do or do not serve to recompose what it is that particular practices comprise and on the ways in which this process is intimately connected to the creation of new notions of what the proper conduct of electricity involves.

### *Timing Use*

Time of use (TOU) tariffs, which seek to increase the price of electricity in the peak periods of use and offer discounts at other periods are a core feature of many smart grid interventions. In the CLNR project, over 600 residential customers have been recruited to trial a three-banded TOU tariff (a proposition that was oversubscribed). As a governmental technique, the TOU tariff introduces both new knowledge, about the variation in energy prices over the day, and new things, from fridge magnets representing the day in red, amber and green zones, to smart meters, and new forms of energy bill, into households. Analysis suggests that these have been readily incorporated into laundry and cleaning practices in some households:

“RES(f): The dishwasher I'd put on eight to nine in the evening.” (GP26, TOU Tariff)

“I started to do the laundry on the weekend because they say it's more practical to use the washer or the dryer financially at the weekends” (MJRTL11, TOU Tariff)

“RES(f): I have to make sure I do me' ironing either first thing in the morning or after like eight o'clock at night.

RES(m): You still do it in day time, not at the peak time ...

RES(f): Yes. I definitely don't do it peak time.

RES(m): But it don't take you long to do the ironing anyway. Half an hour and it's done, isn't it?"

(GP25, TOU Tariff)

As hinted at here, the TOU tariff also seems to prompt participants to make fuller use of aspects of existing technologies. Timers, which appear to have been dormant in the workings of households, come to have new meaning in relation to the TOU tariff, demonstrating the ways in which new things actively realign the existing configuration of practices resulting in modified performances that deviate from previously stable states. In this sense, old things are renewed:

"It's only meal times (that are inflexible), everything else we can work around it, in some cases we have changed. Things like laundry, putting the dishwasher on. We use to put it on after tea, now it'll get left 'til the next morning, or after 8. Changing the program as well. The program we used to use was 2.5 hours, now we go to program 4 which is a soak for 10 mins, then when that's finished we go to program 3 for 45 mins. You're talking no more than an hour. You're in and out of the kitchen anyway so you just do it as you go." (GP19, TOU)

In other cases, there was no scope for modification, particularly where this relates to the ways in which cooking and evening watching television are timetabled into daily and weekly routines. Evening television watching and cooking were reported by participants as being among the most sacrosanct of daily routines, associated with great pleasure, indulgence and reward:

"Their age and everything ... its her only pleasure." ... "yes I've got it (smart TV) but I've got to watch it when it's on. It's the routine. 5 o'clock, I watch the Chase, oh yes ..." (GP020, TOU Tariff)

"RES(f): Yes, my cooking can't be that flexible because of my diabetes. [...] I cook in different times than I actually eat." (GP22, TOU)

For those trialling the TOU tariff, this distinction between flexible and inflexible practices was marked, while it was far more difficult to identify different groups of households between whom there were clear differences in terms of their ability to be flexible. While income did affect aggregate energy demand, the qualitative data reveals that the level of flexibility within any one household context can be traced to the practices they undertake rather than to their specific socio-demographic characteristics, and to the ways in which interventions reconfigure the disposition of things through which such practices are conducted.

### ***Solar Gain***

The CLNR project involves the participation of households with low carbon technologies (PV, micro-CHP, air-source heat pumps and electric vehicles); technological intermediaries that variously involve new forms of small-scale energy provision or alternative service arrangements. For those who have installed PV, our research suggests that the technology is active in reinforcing the transactional mode of relating to the grid that has dominated the UK energy sector, whereby individuals engage in the calculation of their own energy use and production through financial concepts and logics:

(Why did you get solar panels?) “That gives us an income of about £1,500 quid. ... I had the money at the time and it seemed like a good idea. And it doesn’t do anything any harm.” (ML28, Solar PV)

“I think it’s 10 years to pay it off, and it’ll be about 10 years when we retire and our income goes down but by then it’ll be paid for ... and then it’ll be pure profit. We will benefit won’t we? ...because we’ve no intentions of moving.” (DL13, Solar PV)

The UK’s feed-in tariff, particularly in the presence of low interest rates and insecurity about housing and financial markets, led to PV being regarded as one of the most secure and profitable forms of investment during 2010 – 2011. For those households participating in CLNR where PV is a standalone technology, our research suggests that new ways in which the uptake of PV is shaped by a particular form of electricity conduct are emerging which leverages powerful and already existing financial practices concerning investment and saving in order to bring

about decarbonisation. Electricity comes to be generated and used in accordance with securing finance and investment, in turn shaping the ways in which it is understood within the household such that little attention is paid by PV-only households to their use of electricity. Rather, people in this group associated the PV panels with a revenue stream and developed techniques for monitoring these that were more akin to other financial management techniques than energy management measures. For example, participants had created records of generation and consumption that resembled statements of accounts and these were used to make financial flows visible but there was little linkage made between these records and the modification of energy use in the home:

(How about the PV meter?) I check it every day. I've got all the stats since we got it, the monthly stats. ..  
When the number goes round, that's how many units we've brought in, and shoved out to the grid."  
(DL20, Solar PV)

"The first year I got about £1,600 and since my electricity bill that year was £900, and I was quite happy.  
The electricity prices are going up far faster than the the FIT." (DL15, Solar PV)

### ***Navigating the Traffic Lights***

Of all the aspects of smart grids to come under the scrutiny of social scientists, it has been the smart meter that has received most (critical) attention (e.g. Hargreaves et al. 2010; 2012). Participants in the CLNR trial are equipped with a smart meter and an in-home display (IHD) that provides information about energy use in real time as well as a traffic light scheme which seeks to inform households when their use of electricity is 'low', 'medium' or 'high'. Like the TOU tariff above, this technique involves both the provision of new forms of knowledge (codified in the form of leaflets, a website, and a customer helpline) as well new things (the smart meter, the IHD and its metrics for recounting energy use, the traffic light colours). For some participants, this combination of 'knowledge and thing' was providing a new means through which to articulate their relation to electricity use:

“Well, I (used to) just fill the kettle up and plug it. Now when I see that little thing going orange I think: nooo. So I just use just enough for my cup of tea. [...] But it's [IHD] just making [me] a little bit more aware of how much energy I am actually using.” (GP22, TOU Tariff)

“I mean you can see the peaks ... If someone's used summat' you can see it goes it, I mean its like a skyscraper. On a rare occasion it goes red. There's be 2 high voltage things on at a time it goes red. If the kettle and deep fat fryer's on together. ... I think they're better than not having anything at all. ... I think we try to use less because they're showing you how much you're using.” (DL04, IHD only)

“How do you use the Smart Meter?:

"Adult Daughter: Just checking how much she uses -

Elderly Mother: I don't use it If used it I would press the wrong one probably. I love it (the traffic lights)

Daughter: When she puts something on she'll go 'oooh its changing', ... so that's a good thing for her, rather than just reading it. ... We've seen it go up 2, its been up 2 things.” (GP20, TOU Tariff)

Furthermore, in some cases it was possible to see that these things are actively enrolled in different forms of practice, both as a means of translating between different forms of electricity use as well as in the active reordering of how practices are enacted:

“I've changed light bulbs and everything for those energy ones ... the idea is, trying to keep that thing on the green. ... You can't all the time between 4 and 8 - I mean they're not daft I mean they pick the time when you get the tea and that ready, you know what I mean. So I use the oven, but then again I'm not using the oven near as much and I'm often using a slow cooker which I barely used before - things like that, it's surprising you know ... and doing things like they say, like turning things off.” (GP27, TOU Tariff)



“My husband keeps going ‘get it off!’ get the kettle off! ... we just use the traffic lights and how much you use per day. We look at the pounds and pence... I had a little look at the carbon emission but...”  
(GP28, TOU Tariff)

Our research suggests that there is some continuity of the effect of smart meters and IHD, with participants still discussing the ways in which they use them as part of the everyday workings of households on the follow-up visits made as part of the research. Whereas some research has found that “all of the monitors rapidly became ‘backgrounded’ and embedded into everyday household routines such that an initial and conspicuous ‘nag factor’ quickly gives way to a ‘casual’, unthinking and routine form of use” (Hargreaves et al. 2012: 7), our data suggests that this is not always the case. Here, as with the discussion of TOU tariffs, the ways in which in-home displays caused existing practice configurations to be stretched and reconfigured, in part because of the insertion of new things into the practice mix, but also because old things came to be seen in a different light, is suggestive that some degree of sustained change may take place. This is not because of changed attitudes toward energy use as might be theorised under a choice based conceptual model of energy use ‘behaviour’, but rather because old ways of washing clothes, dishes and so on come to be discarded while new ways to do things are revealed which then make sense within rationales concerning the management of the household economy and, in the case of participants with PV panels, investment performance. Through such processes new ways of conducting everyday life become normalised.

Each of these vignettes suggests that smart grid logics and techniques, manifest in the insertion of new ideas and things in households designed to reconfigure everyday practice, have been capable of directing new forms of electricity conduct in which the subjects of intervention come to regard themselves in accordance with this new grid logic. As governmental techniques, such interventions do not “prescribe or forbid practices” but encourage “householders to utilise their skills, practical knowledge and available material infrastructures with reference” to “new practice rules” (Strengers 2011: 51). As the discussion above suggests, in some instances, these new practice rules, of, for example, when electricity should be used, what electricity is (a resource, a cost, an investment), and what it means to use (too much, too little) electricity, have come to shape the conduct of some forms of practice. Importantly, however, such forms of conduct are not universally transposed across all forms of social practice. We

find, for example, that household chores, washing clothes, dishwashing and tumble drying have been reconfigured through these interventions, while forms of cooking and entertainment are regarded as more essentially routed in the rhythms of households and less able to be flexed in accordance with the imperative of shifting demand outside of the peak (Powells et al. 2013). Likewise, in relation to PV generation, it has been in relation to those practices which involve the use of white goods or, where in-home hot water storage is included, showering, that have been reordered in relation to logic of using energy generated onsite rather than exporting it to the wider grid, while other forms of social practice where electricity is an essential resource have remained relatively unaffected (Bulkeley et al. 2013).

## **Conclusions**

In this chapter, we have sought to examine the ways in which smart grids are emerging not as singular, fully formed technical projects imposed from above, but as interventions that require continual making and remaking through engagement with the everyday practices and materialities of (in this case) domestic social worlds. In taking this position, we have found it helpful to engage governmentality and social practice theories, to consider how, and with what consequences, the governing of smart grids works through the reconfiguration of practices such as washing and cooking both through the insertion of new things in these socio-technical assemblages and through the constitution of new forms of electricity conduct which create new meanings about what it is that electricity use should involve. Our analysis finds that the fitting of new things into practice constellations is a critical means through which the smart grid is (and is not) coming into being, as new technologies and techniques are being adopted within and altering forms of everyday practice. At the same time, we have also found evidence that what Strengers (2011) terms new practice rules, or what we have here suggested can be conceived as norms of electricity conduct, are also critical in configuring new forms of socio-material arrangements in relation to the logics of the smart grid.

Such an analysis suggests that everyday practices, while structured through wider social forces, rhythms and routines, can be subject to intervention: that governing can indeed work through their socio-technical fabrics to

create new dispositions of things in which what constitutes appropriate conduct is reconfigured. This suggests, firstly, that attempts to govern practice in relation to desired social goals can be effective where technologies and techniques can be fitted into existing domestic configurations while being able to reassemble and realign how aspects of everyday life are related to governmental rationales. We find that the material means that are deployed in the performances of everyday life present opportunities for a range of actors concerned with establishing such new forms of conduct, whether this be government agencies, utilities or community-based organisations. Interventions that focus on information alone are unlikely to achieve such effects, unless they become embedded within and related to the other constituent components of, in this case, those practices which have significant electrical footprints. Rather than focusing on the quest to identify the most flexible socio-demographic groups within the population, our analysis suggests that the nature and extent of flexibility is deeply tied into practices. This suggests that those in industry, regulatory and governmental positions might be more successful in realising flexible demand by looking for and cultivating flexibility in particular practices (laundry, dish washing and household chores would be likely candidates) than in particular socio-demographic groups or clusters. This approach would require a change from engaging with households through the meter and the energy supply market to an approach which seeks to engage with practices through their components. This is in line with Schatzki's call to seek out new ways to reconfigure landscapes of materials and conventions in order to bring about more sustainable ways of conducting ourselves (Schatzki, 2013). We argue that the trials of TOU pricing in the CLNR project indicate that where devices can be re-configured or their functionality surfaced by interventions that resonate with rationales such as managing household economies then performances of practices can mutate, and that of these mutations some will endure.

Yet at the same time, such an account points to the unruly, emergent nature of practices, to their malleability in relation to new things, ideas and interventions, which may just as likely emerge from the social and private world as from interventions designed to act on practice in line with particular governmental projects. The generative nature of practices, their ability to mutate and deviate through combination and always imperfect repetitions, means that interventions may be rejected, contested or come undone in the face of the presence of competing things and ideas, rationales and forms of conduct. Governing smart grids is therefore not a single project, but an

on-going and imprecise process prone to breakdown, revision and one which requires constant repair and re-establishment, in which multiple alternative outcomes are ever present.

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